

Centre Number				Examination Number									



85000410



EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level



5070/2

Chemistry

Paper 2 Theory

2020

Additional materials:

- Calculators (non-programmable)
- Graph paper

Time: 2 hours

Marks: 80

Instructions to Candidates

- 1 Write the **centre number** and your **examination number** on **every page** of this question paper and on the separate **Answer Booklet/Paper** provided.
- 2 There are **twelve (12) questions** in this paper.

(i) Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

(ii) Section B

Answer any **three** questions.

Write your answers in the separate Answer Booklet provided.

At the end of the examination, fasten your Answer Booklets securely to the question paper.

<i>For Examiner's Use</i>	
Section A	
Section B	
B9	
B10	
B11	
B12	
Total	

Information for Candidates

- 1 The number of marks is shown in brackets [] at the end of each question or part question.
- 2 The **Periodic Table** is on page 14.
- 3 **Cell phones are not allowed in the examination room.**

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Section A: [50 marks]

Answer **all** questions in the spaces provided.

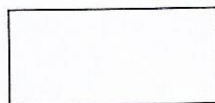
A1 (a) (i) Explain why most laboratories do not have smooth floors, but have rough floors.

.....
..... [1]

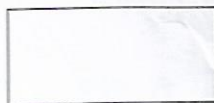
(ii) Give **two** laboratory safety rules you would need to observe when carrying out a titration.

.....
..... [2]

(b) Draw the arrangement of particles in a solid, liquid and gas in the spaces below.



Solid



Liquid



Gas

[3]

(c) Explain why

(i) for the same space occupied, solids have higher densities than liquids and gases.

..... [1]

(ii) gases are compressible.

..... [1]

[Total: 8]

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A2 Crystals of copper (II) sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) are obtained from aqueous solutions of copper (II) sulphate (CuSO_4)

(a) State the four steps (processes) in their correct order, and for each step give the reason for carrying out such a step, in obtaining the crystals.

(i) Step 1:

.....

Reason:

..... [1]

(ii) Step 2:

.....

Reason:

..... [1]

(iii) Step 3:

.....

Reason:

..... [1]

(iv) Step 4:

.....

Reason:

..... [1]

[Total: 4]

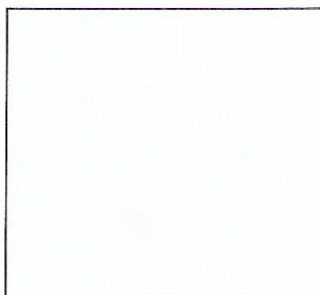
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A3 (a) A coefficient and subscript on the symbol of nitrogen atom (N) mean different notations in chemistry.

(i) What is the significant difference between the two notations 2N and N₂?

.....
 [1]

(ii) Draw the dot and cross structures showing outer shells only for the two notations.



2N



N₂

[2]

(b) Both carbon tetrachloride (CCl₄) and Potassium chloride (KCl) are compounds of chlorine.

(i) Compare the electrical conductivity of liquid carbon tetrachloride and liquid potassium chloride.

.....
 [1]

(ii) Which of the two compounds has a higher melting point? Explain your answer.

.....
 [2]

[Total: 6]

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A4 A sample of 0.03g of small pieces of magnesium was added to 20cm³ of 0.10mol/dm³ of hydrochloric acid. The two reacted according to the equation below.



(a) (i) Write the word equation for the above reaction.

..... [1]

(ii) What is the chemical test for hydrogen gas?

..... [1]

(b) (i) Calculate the mass of magnesium which was in excess.

[4]

(ii) Calculate the volume of hydrogen that would be produced at r.t.p.

[2]

[Total: 8]

Turnover

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A5 (a) Use the Periodic Table to state the

(i) name of the element with electronic configuration: 2,8,18,7
..... [1]

(ii) chemical symbol of the element that forms an acidic oxide of formula XO_2 as its only oxide,
..... [1]

(iii) name of the most electronegative halogen,
..... [1]

(iv) name of the element in Group V and period 3,
..... [1]

(v) number of metals in Group IV.
..... [1]

(b) Elements A, B, C, D and E are arranged in order of their increasing atomic numbers. If element C is a noble gas, state the

(i) formulae of the ions formed by B and E.
.....
..... [2]

(ii) only noble gas that cannot be C.
.....
..... [1]

[Total: 8]

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A6 Choose from the list of oxides given below to answer the questions that follow. An oxide may be chosen once, more than once or not at all.

Al_2O_3 , CaO , CO_2 , CO , Fe_2O_3 , H_2O , ZnO

(a) Which **two** oxides are amphoteric?

.....
 [2]

(b) Which **two** oxides are neutral?

.....
 [2]

(c) State the other **two** types of oxides. Give an example of each type of oxide from the table.

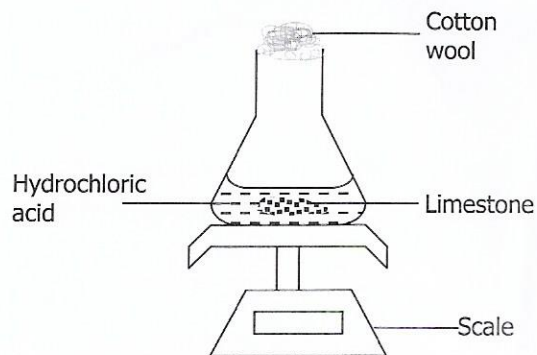
(i)
(ii) [2]

[Total: 6]

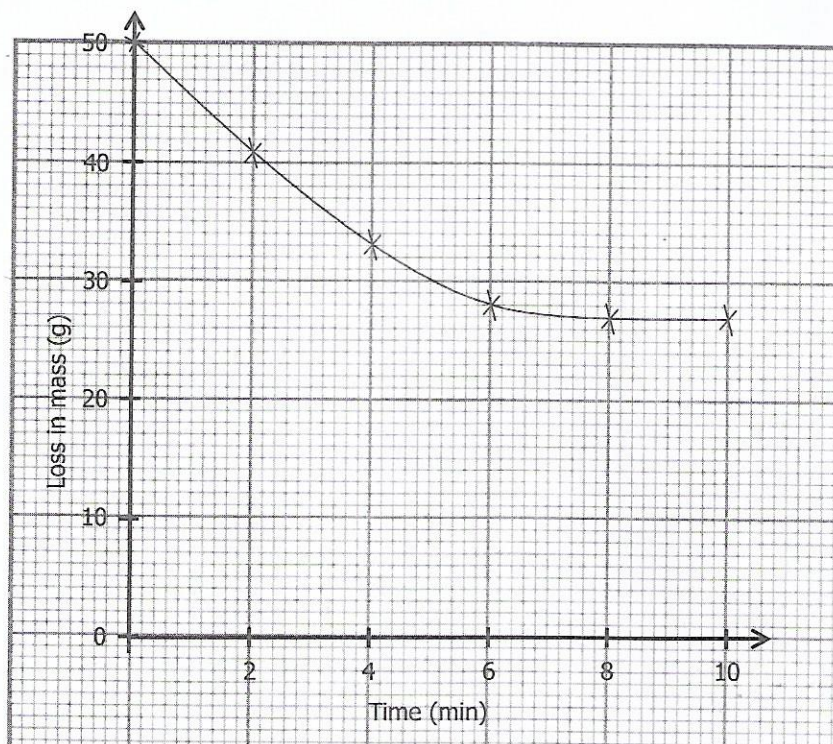


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A7 The diagram below was used to measure the rate of reaction. The initial mass of the beaker and its contents was 50.0g.



The graph below also shows how the reaction between limestone and hydrochloric acid proceeded with time.



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(a) What mass of carbon dioxide was lost when the reaction went to completion?

[1]

(b) Calculate the mass of calcium carbonate used in the first 1 minute.

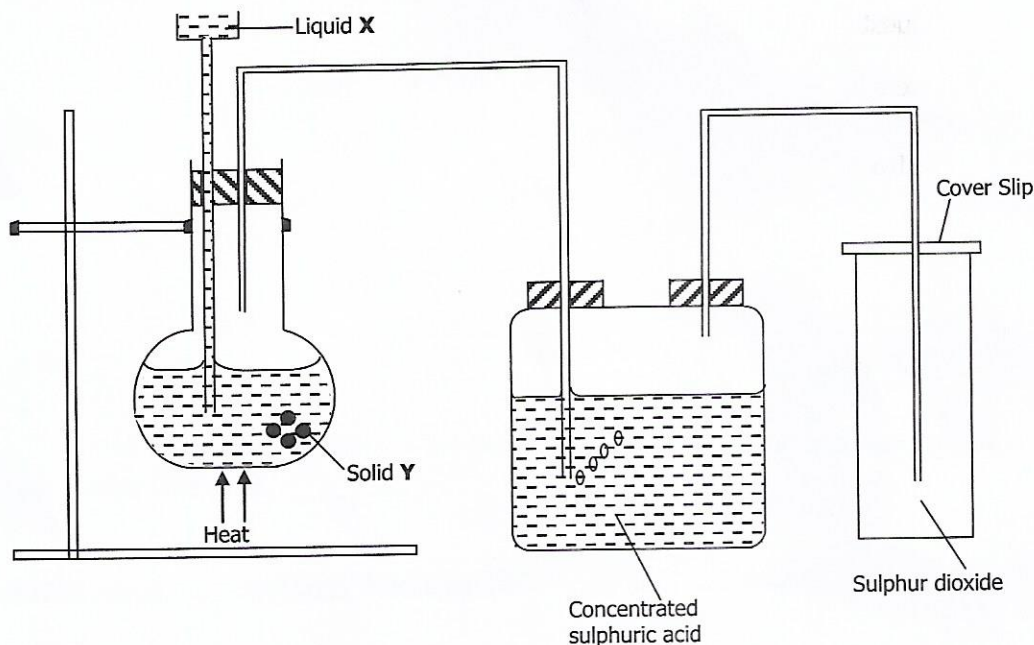
[2]

(c) On the same graph, sketch how the curve would appear if powdered limestone was used.

[1]

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A8 The diagram below shows laboratory preparation of sulphur dioxide.



(a) Name the reactants X and Y.

.....
 [2]

(b) Write a balanced chemical equation for the reaction in (a) above.

.....
 [2]

(c) What is the chemical test for sulphur dioxide?

.....
 [1]

(d) Why is the gas passed through concentrated sulphuric acid?

..... [1]

[Total: 6]

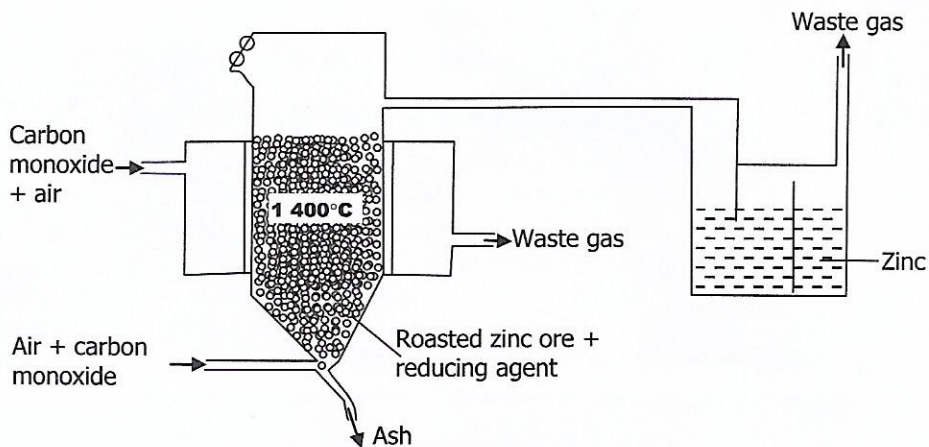
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Section B (30 marks)

Answer **three** questions from this section.

Write your answers in the separate Answer Booklet provided.

B9 Zinc is extracted from its sulphide ore, zinc blende, in a blast furnace shown below.

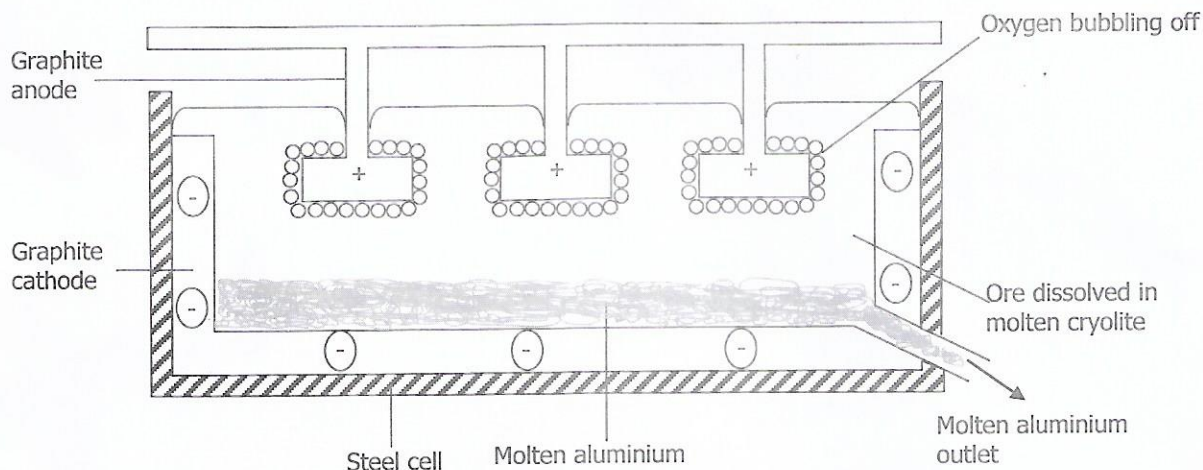


- (a) What reducing agent is used in the extraction process shown above? [1]
- (b) Name another ore from which zinc can be extracted. [1]
- (c) Write a balanced chemical equation for the reaction which occurs when zinc blende is roasted in air. [2]
- (d) Name a pollutant gas which is produced when zinc blende is roasted in air. [1]
- (e) Describe how the named pollutant in (d) is converted to a useful product in industry. [3]
- (f) (i) Zinc is often alloyed with other metals. Name an element which is alloyed with zinc to form brass. [1]
- (ii) Give **one** use of brass. [1]

[Total: 10]

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B10 The diagram below shows how aluminium is extracted in industry.



- (a) Name the ore from which aluminium can be extracted. [1]
- (b) Why is aluminium oxide dissolved in cryolite? [1]
- (c) Which electrode has to be frequently replaced during the process? Explain your answer. [2]
- (d) Write equations for the reactions taking place at the anode and cathode. [2]
- (e) Aluminium is used to make pots and pans because it is a good conductor of heat and it is light. Give another property of aluminium that makes it suitable to be used for making pots and pans. [1]
- (f) A current of 50A is passed in the electrolyte for 1 hour. Calculate the mass of aluminium that will be produced. (1F = 1 mole of electrons = 96 500C) [3]

[Total: 10]

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B11 The molar enthalpy changes of combustion of the first 4 alkanes are given as follows from calorimetric combustion analysis:

-890kJ/mol, -1 600kJ/mol, -2 220kJ/mol and -2 880kJ/mol, respectively.

(a) Suggest the molar enthalpy of combustion of the fifth alkane. [1]

(b) Explain why the amount of heat energy produced increases consecutively when 1 mole of each alkane burns completely. [2]

(c) Write the balanced equation for the complete combustion of the second alkane showing the enthalpy of combustion. [2]

(d) (i) Use the following bond energies to calculate the ΔH for the reaction:



Bond	Bond energy kJ/mol
C-H	412
O=O	490
C=O	826
O-H	464

(ii) Draw an energy level diagram for the combustion of methane? [5]

[Total: 10]

B12 The following table shows information about some homologous series of organic compounds. Each compound shown is the second member of the homologous series.

Homologous series	IUPAC name of compound	Displayed structure
Alkanes		
	Ethanol	
		$\begin{array}{c} \text{H} \quad \text{O} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \\ \text{H} \end{array}$
Alkenes (Olefins)		

N.B: Each homologous series has an alternative name.

(a) Copy and complete the table. [4]

(b) The third member in the family of alkenes is isomeric. Draw **two** of the isomers and give the IUPAC name of each isomer. [4]

(c) The formula $\text{C}_2\text{H}_4\text{O}_2$ generates two different compounds **A** and **B**. **A** is sweet smelling while **B** choke(s, but reacts with Na_2CO_3 to produce CO_2 . Identify **A** and **B** by their structures. [2]

[Total: 10]

